



The Economic Tale of Two Amazons: Lessons in Generating Shared Prosperity while Protecting the Forest in the Peruvian and Colombian Amazon

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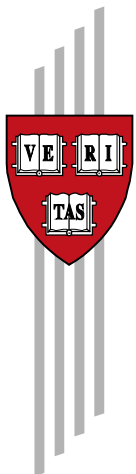
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Protecting the Forest in the Peruvian and
Colombian Amazon*

Timothy Cheston and Alejandro Rueda-Sanz

CID Research Fellow and Graduate Student
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The Growth Lab at Harvard University

February 2023

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Executive Summary

Achieving economic prosperity in the Amazon rainforest is often seen as incompatible with protecting the forest. Environmental researchers rightly warn that rapid deforestation is pushing the Amazon close to a potential tipping point of forest dieback into grassy savanna. Less has been said about what is required to generate shared prosperity in Amazonian communities. Deforestation is often treated as inevitable to serve human needs, local and global. This report synthesizes the findings of two engagements by the Growth Lab at Harvard University that study the nature of economic growth in two Amazonian contexts: Loreto in Peru, and Caquetá, Guaviare, and Putumayo, in Colombia. The aim of these engagements is to leverage the Growth Lab's global research into the nature of economic growth to apply those methods to the unique challenge of developing paths to prosperity in the Amazon in ways that do not harm the forest. This report compares and contrasts the findings from the Peruvian and Colombian Amazon to assess the extent to which there are generalizable lessons on the relationship between economic growth and forest protection in the Amazon.

The central lesson of the research is that the perceived conflict between economic growth and forest protection fails to hold in the evidence from the Peruvian and Colombian Amazon. Many parts of the Amazon find themselves in the “lose-lose” scenario of low prosperity and high deforestation. Rates of deforestation differ across locales more than the rates of economic growth. Alarming increases in deforestation are not found to be accompanied by greater economic growth. This is due to the fact that the drivers of prosperity and deforestation are distinct – as they happen in different places. Deforestation occurs where the agricultural frontier meets the forest edge, often through extensive cattle-ranching. By contrast, the economic drivers in the Amazon are its urban areas often located far from the forest edge, including in non-forested piedmont regions. These cities offer greater economic complexity by accessing a wider range of productive capabilities in higher-income activities without those activities driving deforestation.

The most underutilized tool for economic prosperity in the Amazon is its cities. Perhaps the most surprising facet of life in each of the four Amazonian regions studied is that the majority of people live in urban areas. This is a telling fact of economic geography: that even in the most remote parts of the Amazon, people want to come together to live in densely populated areas. How can one explain Iquitos, a city in Loreto deep in the forest that cannot be reached by road, but is home to more than 470,000 people? Yet Iquitos matches the findings of our global research that the secret to shared prosperity is productive knowhow – that as a society expands the range of knowhow available, it increases the diversity and complexity of its production. A place grows by adding new knowhow to produce more, and more complex, things. To bring different knowhow together, people must live near each other. Hence, cities form, affording greater complexity and prosperity, and, crucially, city activities are not those linked to deforestation, like low complexity cattle-ranching.

Resources in the Amazon are being spent in the wrong direction, by targeting the forest not the cities. Because deforestation is happening in the forest, resources targeting forest conservation are being spent to support a small minority of families to improve their livelihoods. But just because a flat tire is flat at the bottom does not mean the hole is there. The source cause of deforestation in the Amazon is its stagnant, disconnected cities, where underinvestment in urban roads, water, sewage, and housing result in weak generation of higher income opportunities, despite being where the majority live. The solution to deforestation, as with that of creating shared prosperity, relies on generating better opportunities in cities to pull more people in from rural areas to reduce the pressure on expanding the agricultural frontier into the forest. This is consistent with our research: there are few global cases of generating prosperity in the forest, but vast examples of building thriving urban spaces. Shared prosperity is easier to achieve in urban areas than in the forest.

The defining feature of the Amazonian economies is its remoteness. The long distances and travel times to large markets outside the region present a significant constraint to competitiveness in each of the four regions studied. Yet these regions also face an additional “connectivity trap” that further limit the viability of economic diversification. The lack of quality, timely transport connections with external markets

restricts the economy complexity of the Amazon and, in turn, the low complexity of the cities limits the returns to new investments. In Colombia, transport costs from Amazonian cities to the rest of Colombia are exceedingly high, even when controlling for distance. Transport routes often depend on a single route, for which any disruption (e.g., blockades) adds costs and uncertainty. The lack of transport connectivity presents a binding constraint to the profitability of agro-processing and time-sensitive agroforestry products in many parts of the Colombian Amazon. The extreme isolation of Iquitos in Loreto results in a higher level of economic complexity than expected. Given the extensive time required for imports and exports to Iquitos, the research finds that a set of activities, such as beverage bottling, are viable to produce locally rather than import. This affords a more complex set of industries than those that would be competitive if exposed to import competition. However, this extreme remoteness also puts a ceiling on production at the level of local demand, as exports face these time requirements as a disadvantage in reaching external markets.

Achieving shared prosperity in the Amazon depends on the connectivity and opportunity in its urban areas. What a city is able to export or sell outside the city determines the success of the city. The economic challenge in the Amazon is that its cities do not export, in that they sell few things outside the city. This further limits the capacity to import those items the city does not produce. The need to expand exports to be able to afford the imported inputs for more complex activities describes a fundamental coordination challenge behind connectivity in the Amazon. The region may learn from the Peruvian experience with Executive Tables (*Mesas Ejecutivas*), which organize in public-private coordination by specific economic activities where the private sector players face shared problems in growing the business to thereby address those constraints. Amazonian regions should create an equivalent Amazon Prosperity Taskforce, organized by promising activity to resolve constraints through public-private coordination. Just as ProColombia and ProInversion in Peru aim to attract global investors to come to Colombia and Peru, so too must the Amazon Taskforce expand the local government's reach to attract investors from other parts of the country to come to Amazonian cities (i.e., a la ProLoreto or ProGuaviare). Achieving urban prosperity depends not only on improving the public services in cities but on enhancing the transport connectivity with the rest of the country. Road construction in the Amazon forest is found to play a central role in deforestation. A strategic approach to connectivity should select projects to improve road connections of Amazonian cities to the rest of the country where those connections occur through non-forested areas or build on existing roads, while further restricting road projects in the forest.

The strategy should be territorial across three geographies of opportunity: (i) *in cities*, through tourism services, transport services, professional services, and agro-processing industry; (ii) *in rural non-forested areas*, in more intensive crops and sustainable agroforestry; and (iii) *in forest areas*, based on ecotourism, carbon markets for reforestation, and forest protection services. The Amazon Prosperity Taskforce should also serve the distinct local productive opportunities across Amazonian regions, e.g., tourism in Chiribiquete National Park for Caquetá and Guaviare vs. food and chemicals in Loreto.

The greatest promise for prosperity in the Amazon is to make forest protection pay, particularly through carbon markets. If deforestation is driven in large part because the private returns to owning deforested land are higher than the social returns of keeping that land as a forest, then the goal of policy should be to make forest protection and reforestation more profitable than deforestation alternatives like cattle-ranching. Reforestation with carbon credits is not a profitable activity in any Amazonian country at today's prices and with carbon titles that are unclear and costly to enforce. Making carbon credits tradable, to take advantage of international carbon markets, with prices of \$80 per tCO₂e in the European Union vs. \$5 in Colombia, offers a transformative market that would shift incentives toward forest protection. To capture the potential gains, each Amazonian country must accelerate the steps now toward carbon market integration, to strengthen its legal framework, certifications, oversight, reforestation capabilities, and related technologies for contracting and enforcement. The challenge remains that deforestation can operate at alarming rates due to the actions of a few, for which greater participation in environmental protection services or slight gains in carbon prices may not provide a sufficient solution. The direction of change is clear that local carbon prices must rise to incentivize for all the shift toward forest protection. While today's prices remain too low, one can imagine a near future in which the right government investments make carbon titling readily contractable and sold in the global market at much higher prices to make forest protection the best means to prosperity.

1. Introduction

The resilience of the Amazon rainforest to deforestation is essential to global carbon capture and the stability of the climate. The Amazon is home to more than half of the world's remaining rainforest, one-tenth of all known species, and an estimated 390 billion trees, as an unparalleled resource for its size and biodiversity. Researchers recognize that the Amazon may play be a tipping element in the planet's climate. The same Amazon is home to 47 million people.

The forest and its human inhabitants are often treated as incompatible: the enormous biodiversity of the forest cannot sustain an economically prosperous population. This has its basis in the empirical reality in which forest loss, climate change, and carbon emissions from deforestation have researchers worried that the Amazon is close to a tipping point of rainforest dieback. Less has been said about the economics of forest communities.

Deforestation is often treated as inevitable to serve the economic needs of human populations, local and global. This too is an empirical question worth answering. At the Growth Lab at Harvard University, we have two decades of research into how to generate shared prosperity. Through engagement with the Gordon and Betty Moore Foundation, we have sought to generate research and policy options on how to greater shared prosperity in such a way that does not harm the forest in two Amazonian contexts: Loreto in Peru, and Caquetá, Guaviare and Putumayo, in Colombia.¹ This paper compares and contrasts the findings from the Peruvian and Colombian Amazon to assess the extent to which there are generalizable lessons on the relationship between economic growth and forest protection in the Amazon.

The research in the Peruvian and Colombian Amazon concludes that achieving shared prosperity does not require sacrificing the forest. Alarming increases in deforestation are often not accompanied by greater economic growth. The research finds that the drivers of prosperity and deforestation are distinct, as they locate in different places. In Loreto, the economic driver is Iquitos, a city found to possess a high degree of productive capabilities for its income level. The research methods identify a series of promising growth opportunities in Iquitos that are non-polluting, non-land intensive, but more complex than existing industries to drive income growth in ways that do not sacrifice the forest. The lower rates of deforestation in Loreto are linked to mining. In Colombia, deforestation occurs where the agricultural frontier meets the forest edge, often through extensive cattle-ranching. Cattle-ranching itself is a low complexity activity that fails to meet the region's growth ambitions. Rather, the economic engines in Colombia are the Amazonian cities. These cities offer greater economic complexity by accessing a wider range of productive capabilities in higher-income activities with little presence of those activities driving deforestation. The solution to deforestation, as with that of creating shared prosperity, relies on generating better opportunities in cities to pull more people in from rural areas to reduce the pressure on expanding the agricultural frontier into the forest.

The biggest misconception of Amazonian economies may be their low population density – in each of the four Amazonian regions studied, the majority of people live in urban areas. Despite the vast expanse of the forest, people vote with their feet and express a clear interest to live in densely populated cities. This follows our global research findings on economic

¹ After Brazil, the largest land area of the Amazon is in Peru and Colombia. These engagements studied areas in each country where the Moore Foundation had a presence and connections with local stakeholders. In both Peru and Colombia, the Growth Lab teams worked with local counterparts and a project steering committee over November 2019-July 2020 and August 2021-February 2023, respectively.

complexity: that as a society expands the range of productive knowhow available, it increases the diversity and complexity of its production. A place grows by adding new knowhow to produce more, and more complex, things, which is best achieved when people near each other in cities. Cities afford greater complexity and prosperity, and, crucially, city activities are not those linked to deforestation, like low complexity cattle-ranching.

The defining feature of the economies of both the Peruvian and Colombian Amazon is its remoteness. The long distances and travel times to large markets outside the region present a significant constraint to competitiveness in each of the four regions studied. Land transport is only feasible to Loreto's main economic center, Iquitos, via river and this mode is unpredictable and lengthy, in spite of its low cost. In Colombia, transport costs from Amazonian cities to the rest of Colombia are exceedingly high, even when controlling for distance. And often depend on a single route, adding costs and uncertainty. The lack of transport connectivity presents a binding constraint to the profitability of agro-processing and time-sensitive agroforestry products in many parts of the Colombian Amazon. These regions also face an additional "connectivity trap" that further limit the viability of new economic sectors. The lack of transport connections with external markets restricts the economy complexity of the Amazon and, in turn, the low complexity of the cities limits the returns to new investments.

Policy strategies from both Amazonian regions focus on the need to resolve coordination failures to foster new, more complex activities in cities. Shared prosperity is easier to achieve in urban areas than in the forest. The most underutilized tool for economic prosperity in the Amazon is its cities. The economic challenge in the Amazon is that its cities do not export, in that they sell few things outside the city (Porcher & Hanusch, 2021). This further limits the capacity to import those items the city does not produce. The need to expand exports to be able to afford the imported inputs for more complex activities describes a fundamental coordination challenge behind connectivity in the Amazon. The engagements found a common binding constraint in the presence of coordination failures in entering more complex activities in cities. The region may learn from the Peruvian experience with Executive Tables (*Mesas Ejecutivas*), which organize in public-private coordination by specific economic activities where the private sector players face shared problems in growing the business to thereby address those constraints. Amazonian regions should create an equivalent Amazon Prosperity Taskforce, organized by industry to resolve constraints through public-private coordination.

Achieving urban prosperity depends not only on improving the public services in cities but on enhancing the transport connectivity with the rest of the country. The assumption that limiting the connectivity of Amazonian cities with the rest of the country will suffice to curb deforestation has not held rising forest loss has occurred over periods with no improvements in primary road connections to the rest of the country. Road construction in the Amazon forest is found to play a central role in deforestation. A strategic approach to connectivity should select projects to improve road connections of Amazonian cities to the rest of the country where those connections occur through non-forested areas or build on existing roads, while further restricting road projects in the forest (e.g., improving existing road connections between San Jose del Guaviare and Bogota, while rejecting new road projects through the forest from San Jose del Guaviare to La Macarena or Miraflores). In Colombia, inter-departmental road infrastructure is the key constraint to greater agro-processing and crop production for these cities to sell to external markets; improving the quality and service of air transport will be critical to expand tourism.

This report synthesizes the central studies of each engagement: (i) an Economic Complexity Analysis, (ii) a Growth Diagnostic and (iii) a Policy Options Report. In addition, the project in Colombia produced two other documents: an analysis of the causes and economics of deforestation and an analysis of the determinants of land prices in the country as a pivotal contributor to deforestation. In the current paper, we discuss the findings of the three pillar papers of each engagement, with the inputs from the additional analyses, and discuss the methodological innovations that have helped develop the Growth Lab's work in remote and ecologically significant regions.

This report is structured as follows. The first section presents a summary of the growth trajectory, economic complexity analysis, growth diagnostic, and policy report for each project. The next section discusses the methodological innovations we used in each engagement and their importance in helping understand the Amazonian economy. The report concludes with the central lessons from the engagements and the key insights for an economic path forward in these regions.

2. What Constrains Achieving Shared Prosperity in the Amazon of Peru and Colombia?

In the vast expanse of the Amazon, what drives economic outcomes: country effects or the basic elements of the forest? This section aims to present the findings from each engagement in Peru and Colombia to then be able to compare experiences to draw lessons from the research. The section is divided across the primary methods used: to start by presenting the growth story of each place; to discuss the existing and potential economic sectors; to diagnose what constrains greater prosperity; and to present policy options to achieve better outcomes.

Growth Story of Loreto, Peru

Loreto's economy is defined by its remoteness. Loreto is among the departments with the lowest population density, as the largest department in Peru, but not the most populous. Despite this remoteness, the population is concentrated in the capital city of Iquitos. Iquitos is closer to the border states of Brazil and Colombia than it is to the capitals of its neighboring regions in Peru - San Martin and Ucayali. Iquitos can only be reached by air or river, making it one of the largest cities in the world without road access. Since the department's founding, Loreto's economy has depended on the exploitation of natural resources, from the rubber boom at the end of the 19th and beginning of the 20th centuries to the oil extraction and exploitation of forest resources that predominate today.

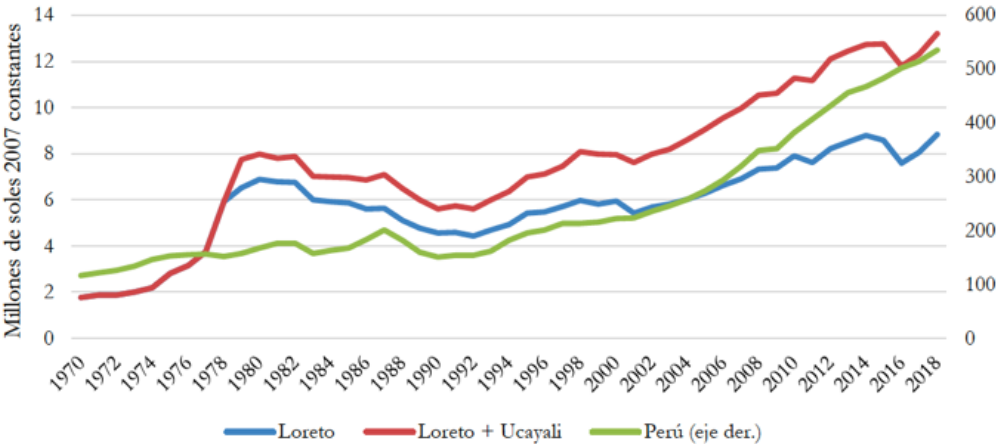
Loreto's economic model, driven by natural resources, faces dual challenges of high environmental damage and low economic growth. Loreto is one of the poorest departments in Peru. With just 10,462 soles of Gross Added Value (GVA) per inhabitant (approx. US\$ 3,150), Loreto is the fourth poorest department in terms of economic activity per capita, at a mere two-thirds of the national average (15,611 Soles, approx. US\$ 4,702). By focusing on natural resources, the economic model has produced a pattern of slow and volatile growth, which has opened an ever-widening gap between the economy of the region and that of the rest of the country. For nearly four decades between 1980 and 2018, Loreto grew at one quarter the rate of the rest of Peru, in average compound annual rates. At the same time, the economic model has brought with it significant environmental damage. In the last decade (2008-2018), the region

has fallen further behind its Amazonian peers in the country (Ucayali, San Martín, and Madre de Dios), which have grown at an average annual rate five times higher than Loreto. In addition to – or perhaps as a consequence of – the challenges of the economic model, Loreto is also among the departments with the worst indicators of social development, anemia, and child malnutrition.

Loreto faces diverging economic returns with the oil sector contracting and the non-oil sector growing into more complex production than expected for the region’s remoteness.

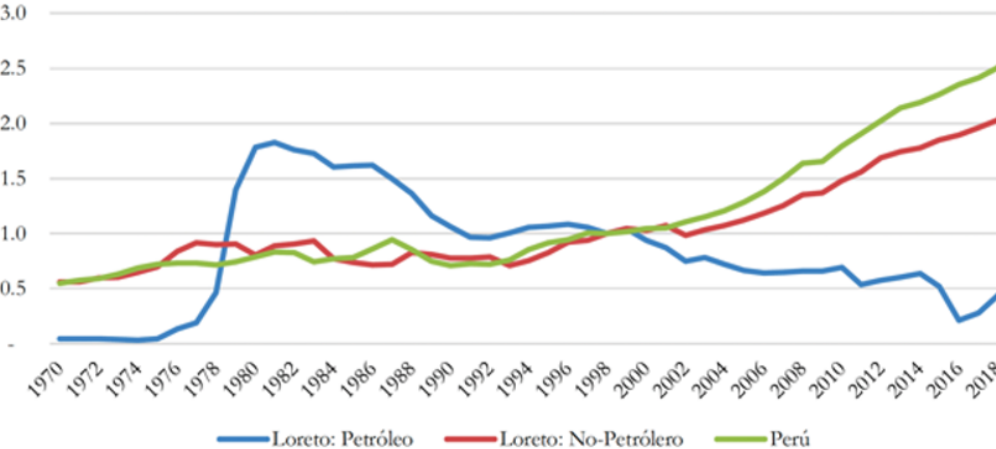
In the last twenty years (1998-2018), hydrocarbon and mining activity has fallen sharply, contracting at an average compound annual rate of -4% in GVA, which is equivalent to a cumulative fall of -56% (Figure 2). In that same period, the non-oil economy of Loreto grew at a significant average rate, 4.2%. Non-oil growth in Loreto nearly matched the growth of the rest of Peru (4.7%) and featured low volatility. The non-oil sector growth is also visible in falling unemployment and the growth in real wages, which did not match the growth rate of the rest of Peru but did meet the level of the other Amazonian regions of the country.

Figure 1: Economic Evolution of Peru vs. Loreto (Gross Value Added)



Source: INEI, Mendoza & Gallardo (2012), own calculations

Figure 2: Economic Evolution of Loreto: Oil vs. Non-Oil vs. Peru (Gross Value Added)

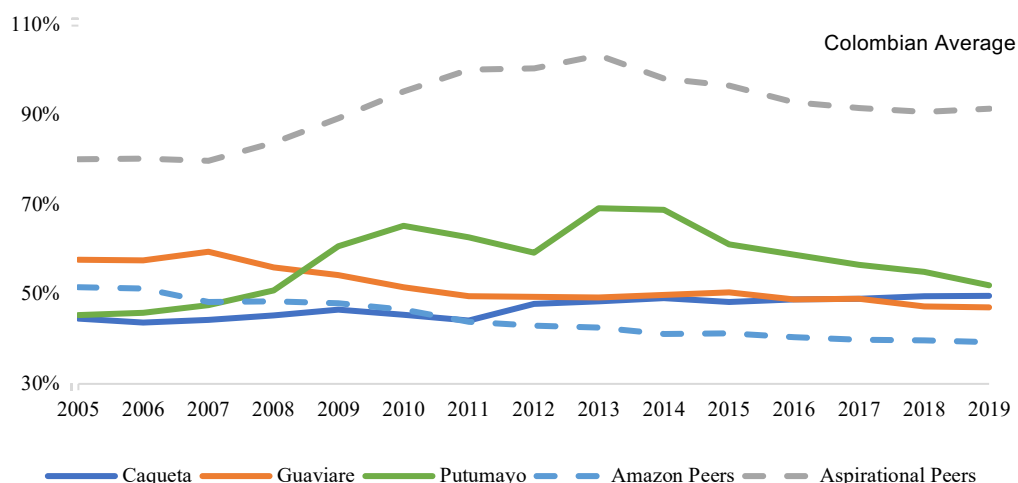


Source: INEI, own calculations

Growth Story of Caquetá, Guaviare, and Putumayo (CGP), Colombia

Economic growth patterns in the Colombian Amazon more closely follow national patterns of oil price volatility and federal spending, than the localized impact of the 2016 Peace Agreement with the FARC. The sharp decline in global commodity prices in 2014 exposed Colombia's dependence on oil exports, reducing key revenue sources domestically. Growth figures nationally fell sharply after 2014, with the Amazonian departments not serving as exceptions. CGP departments have experienced an even sharper growth slowdown than the Colombian average since 2014 despite significant effort from the government in expanding access to economic and social services. Caquetá, Guaviare, and Putumayo are amongst Colombia's ten poorest departments, ranked 22nd, 25th, and 31st respectively in terms of non-oil per capita income. Income levels are less than half of the national average, although slightly above the other Amazonian departments in Colombia. CGP has failed to converge to the national average over recent decades (Figure 3). An added challenge to CGP's lack of convergence to the national average is that Colombia itself has failed to converge to advanced economies like the United States or richer economies in the region. Given the close relationship between CGP's growth performance and the national average, part of the growth challenge lies outside of CGP, to improve performance in the growth poles in Colombia. New findings from Nedelkoska et al (2021) point to the missing "internationalization" of Colombia that has not tapped into its rich resources of knowhow flows to attract new capabilities to Colombia. Many of channels for technological diffusion are not adequately prioritized in Colombia. As a result, there is less technology to be diffused from Colombia's higher-complexity cities to the cities in CGP.

Figure 3. Income Convergence: GDP per Capita as % of Colombia's National Average



Source: authors' elaboration based on DANE and Penn World Table

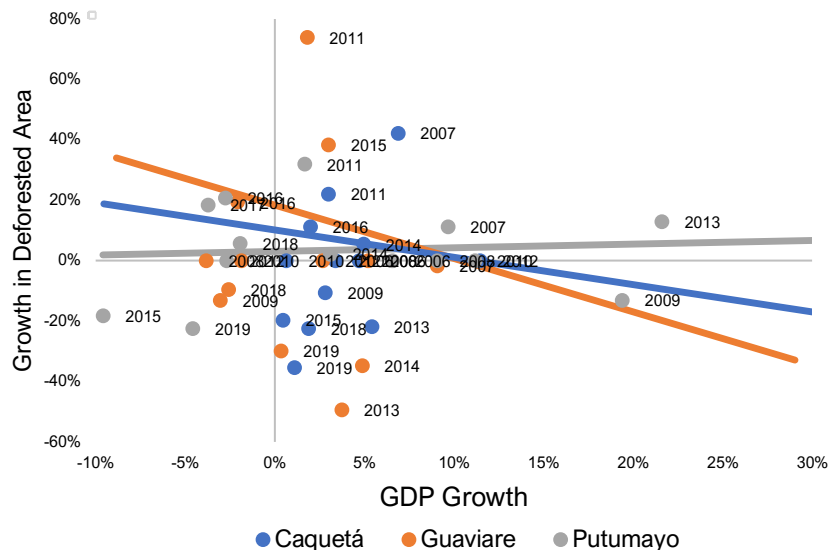
Public spending per capita in Caquetá, Guaviare and Putumayo stands significantly above the Colombian average. The rise in public spending across the oil and non-oil departments in the Amazon has been by the establishment of the new royalty distribution system (*Sistema General de Regalías*) in 2012 and progressive changes in the subnational revenue sharing system (*Sistema General de Participaciones*). Many social indicators of well-being, from security to education, have improved significantly over the period. Violence in CGP has seen a sharp decline over the decade leading up to the Peace Agreement, as measured by the department's homicide rate. There has been a notable increase in the education of the workforce, in line with

the progress Colombia has made in improving educational achievements nationwide. Although these efforts have evidently improved the quality of life of the region's inhabitants, their contribution to the *economic* development of the region has failed to provide a breakthrough, as the region has still failed to converge to the rest of the country.

Rising deforestation has not been accompanied by stronger economic performance, which suggests a potential path to protect the forest and achieve economic development.

Although a trade-off between economic development and environmental sustainability is often discussed in the context of the debate around the protection of the Amazon, there is little evidence that this trade-off exists in the analyzed departments. As suggested by Figure 4, there has been little correlation between income growth and changes in deforestation at the department-level, which implies that higher deforestation has not helped the departments develop their economies. This does not imply that *any* action to promote the economic development of the region would *per se* be deforestation-neutral, but that taking action to detain deforestation is unlikely to affect an already low growth path, and that an economic strategy that does not foster deforestation is indeed a possibility and should actively be pursued.

Figure 4. Deforestation and Economic Growth



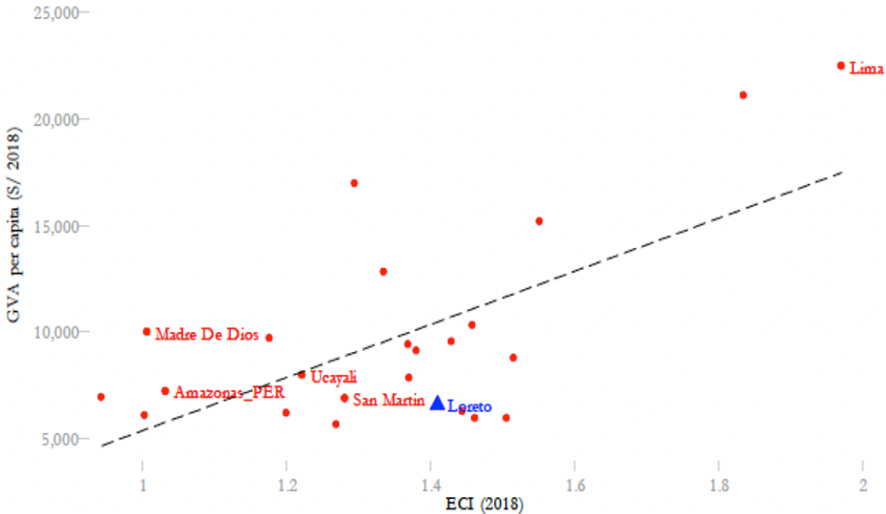
Source: authors' elaboration based on DANE and IDEAM

Economic Complexity of Loreto

Despite its remoteness, Loreto possesses a more complex set of industries and productive capabilities than expected. Loreto's economic complexity ranks near the median of Peruvian states, above most of its Colombian peers, and beneath its Brazilian counterparts (Figure 6). Remote areas face several challenges in achieving greater economic development, starting with the increased travel time and costs to reach export markets, which hinders competitiveness. Loreto's economy is further based on the extraction of natural resources such as rubber, oil and lumber since its founding, all low-complexity industries with volatile returns. Despite this geographic isolation and natural resource-based economy, these industries have generated a productive ecosystem around them that is more complex than one would expect given the circumstances. The extreme remoteness of Loreto, accessible only by waterways, but with a sizeable population in Iquitos has created an economy to support the local manufacturing

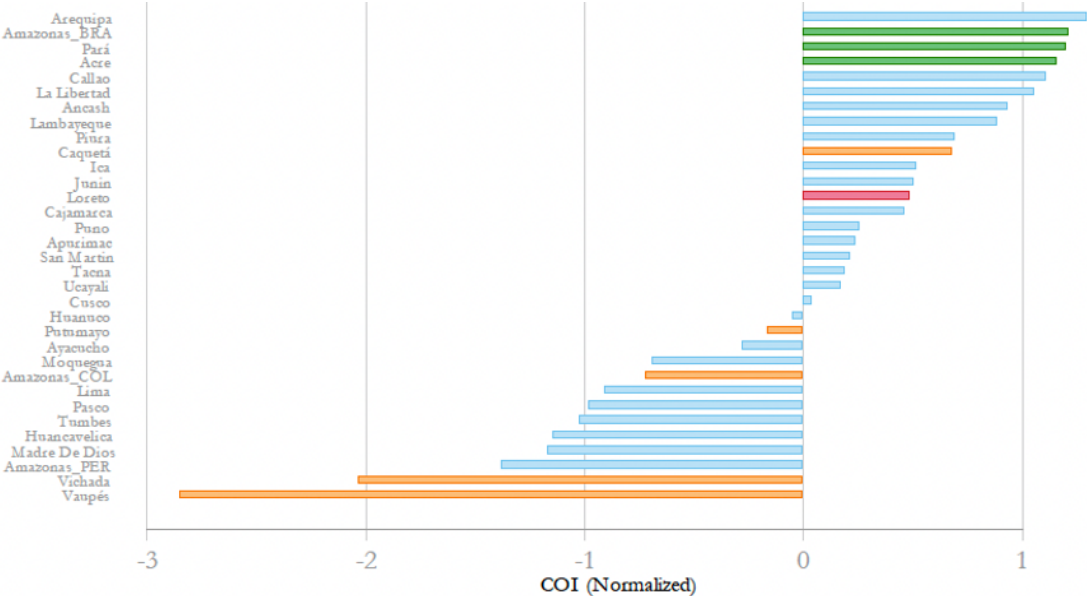
of basic goods, such as a factory for bottles, that has increased the complexity of local production. Ultimately, Iquitos is able to accommodate small-scale, inefficient manufacturing given the extreme costs of transport to reach its remote shores prices out competitors. This existing complexity opens possibilities for Loreto to expand towards other, higher value-added economic activities that can sustain higher wages and contribute to the prosperity of its population. The challenge remains the scale of those activities, as 'exporting' those goods to places outside of Loreto must contend with the steep transport costs that render 'imports' uncompetitive. These dynamics allow for greater complexity than expected for the local economy but may put a ceiling on the market size and products to be limited to local demand.

Figure 5. Economic Complexity Index vs GVA pc for Loreto and Peruvian Regions



Source: Hausmann, et al. (2020), based on Dun & Bradstreet. Note: excluding Moquegua.

Figure 6. Economic Complexity Outlook for Loreto, Peruvian Regions, and Peers



Source: Hausmann, et al. (2020), based on Dun & Bradstreet. Note: This data source used in Loreto is distinct from that used in the Colombia project (GEIH).

Loreto has not managed to achieve transforming its relatively high economic complexity into economic gains, as income levels continue to fall behind national gains. In order to bridge this gap, the studies aim to identify the industries with the greatest potential to drive Loreto's productive transformation based on the existing productive capacities in the region and considering the constraints that prevent such potential from being realized. The analysis yielded 55 high potential sectors, 28 of which are already present in Loreto, and 27 which have yet to be developed but offer potential to build off of existing productive capabilities. These 55 industries have been further grouped into 5 thematic areas: i) Forestry, flora, and fauna, ii) Food and chemical industries, iii) Manufacturing and transport services, iv) Tourism and creative industries, and v) Construction manufacturing. Realizing this potential in Loreto relies on the state's ability to promote greater productivity in strategic sectors that are already present, as well as attracting new business models.

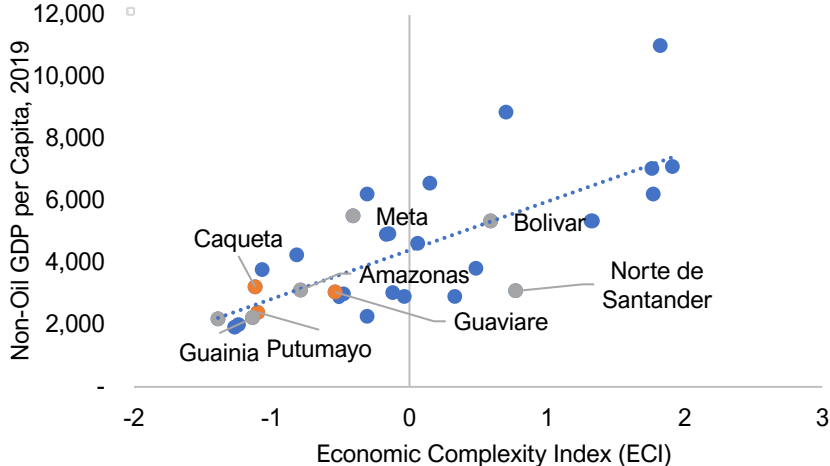
Economic Complexity of Caquetá, Guaviare, and Putumayo

Colombia's Amazon rainforest is one of the richest and *most complex* areas in the planet in terms of its biodiversity; and yet, this biodiversity is currently under attack by some of the *least complex* economic activities, such as cattle-ranching. According to the findings of the economic complexity report, the exceptional diversity of the Amazon's biome is not reflected in the region's economy. Conversely, the Colombian Amazon's economy is best characterized by its low diversity and low complexity, with activity concentrated in low-productivity agriculture and services. The economic model in the Colombian Amazon has been one of extraction since the first settlements for rubber exploitation. The Colombia-Peru war in the 1930s and the 'developmental era' starting in the 1940s led to a new approach to the Amazon by the federal government. The government directed the migration of peasant farmers to colonize the Amazon as a means to prevent military advancement of Peru and to settle the domestic conflict over land rights by granting land in the Amazon. Not coincidentally, this timing also marks the first large migration of cattle to the Amazon, as cattle-ranching takes root in Caquetá. This economic model continues today as CGP departments are included in regional economic groups to specialize in mining and agriculture – with no mention as to how those sectors are meant to interact with the environmental goal of protecting the forest. The extractive colonization model for CGP has failed the Amazon environmentally, but also economically, leaving the Amazon region as one of the least economically complex in the country, dependent on extractive agriculture and mining sectors, and low productivity public and retail services.

The economic complexity of Caquetá, Guaviare and Putumayo is low compared to the rest of the departments of Colombia. While Valle del Cauca, Antioquia and Bogotá lead the ranking, Guaviare, Putumayo, and Caquetá stand as the 21st, 24th and 28th most complex, respectively, among the 32 departments (Figure 7). Moreover, from 2012 to the present, this estimate is fairly stable over time. Despite the Peace Agreement, oil price shocks, and other events of the last decade, Guaviare, Putumayo, and Caquetá started with relatively low complexity and did not improve their position. This situation occurs in a context of Colombia's weak national performance in complexity. Colombia's economy has become less complex over the past decade, falling 8 positions in the Economic Complexity Index to rank 64th out of 133 countries, according to the latest 2020 data. Economic complexity is empirically associated with higher income levels, and also with higher growth rates. The fact that Colombia's complexity is falling over time presents a challenge to the country's growth prospects and further limits the set of technology and know-how in higher-earning jobs that can spread from richer cities in

Colombia into CGP. This suggests that accelerating the growth of these regions faces dual challenges within the region and nationally.

Figure 7. Economic Complexity and GDP per Capita



Source: authors' elaboration based on GEIH and DANE.

The low prosperity in the Colombian Amazon is driven by the lack of prosperous cities. Deforestation occurs at the agricultural frontier, which marks the “arch of deforestation” across Amazonian departments. By contrast, the economic drivers in the Amazon are its urban areas, which afford greater economic complexity by accessing a wider range of productive capabilities. This corroborates the findings of our global research over the past two decades that prosperity results from expanding the productive capabilities available locally to diversify production to do more, and more complex, activities. This reveals a telling fact of economic geography that, even in the remote Amazonian departments of Caquetá, Guaviare, and Putumayo, the majority of people work in urban areas. Amazonian cities do not export, in that they sell few things outside the city. This further limits the capacity to import those items the city does not produce.

Shared prosperity is easier to achieve in urban areas than in the forest. Public resources are being allocated in the wrong direction in the Amazon, with scarce funds being spent at the most remote parts at the edge of the forest to build tertiary roads and bridges to a few families, while underinvesting in urban roads, water, sewage, and housing where the majority of people live. The solution to deforestation, as with that of creating shared prosperity, relies on generating better opportunities in cities to pull more people in from rural areas to reduce the pressure on expanding the agricultural frontier into the forest.

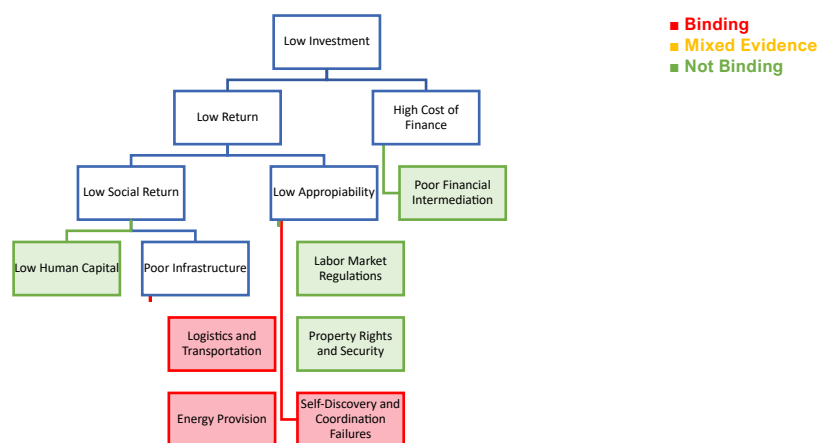
The three Amazonian departments studied lack sufficient complexity to support strong growth. The departments differ in the ease of adding new capacities, with Caquetá in the worst position. One of the central findings of economic complexity research is that the know-how held in an economy differs significantly in how many other industries require the same know-how, defining different paths to diversification. Cattle-ranching, for example, requires capabilities in husbandry that few other industries require, limiting the opportunities for diversification in Caquetá. Putumayo is best positioned of the three to diversify its economy, as the base of professional services in Putumayo are required in many other industries. This situation requires in Caquetá a policy that actively helps to attract new companies, and to resolve the restrictions that hinder the appearance of more complex industries.

Growth Diagnostic of Loreto

Loreto has higher complexity than expected for its income level, which predicts faster economic growth. This raises a series of questions: Why has the region been unable to leverage its existing knowhow to grow rapidly and diversify into new industries? Why have these new, feasible economic activities not materialized spontaneously? One plausible hypothesis is that the remoteness of Loreto has served as a protective barrier. The costs imposed by the remote location discourage imports, while encouraging local entrepreneurs to supply local demand. In this way, the diverse set of industries in Loreto exist, but do not generate the level of income that is usually observed in other economies, as they are less efficient and are restricted by the size of local demand.

The Growth Lab's Growth Diagnostic of Loreto yielded the identification of three binding constraints to Loreto's more sustainable and inclusive growth: (i) limited connectivity, accessible only by river; (ii) the state's inability to coordinate new investments (to solve coordination failures associated with self-discovery); and (iii) access to electricity as a potential future constraint (Figure 8). The study also finds other factors may face certain constraints but are not binding on growth, including financial intermediation, water infrastructure, air transport infrastructure, ICT, returns to education, educational levels, fiscal appropriation, or property rights. Other constraints such as physical security risks or effects of illegal economies are also latent in Loreto, according to evidence gathered during field visits, although they could not be fully tested because of the low availability of data.

Figure 8. Growth Diagnostics Tree for Loreto



Source: adapted from Hausmann, Rodrik, Velasco (2008)

The geographical isolation of Loreto is severe and hinders the movement of people and merchandise. Iquitos is closer to the border with Brazil and Colombia than to other Peruvian cities. Yurimaguas and Pucallpa, the two closest cities in Peru, are 400 kilometers (3-4 navigation days) and 530 linear kilometers away (4-7 navigation days), respectively. Despite the lengthy time to cover these distances, the transport cost for a manufacturing company in Iquitos to move cargo to Pucallpa is approximately US\$13/kg, under certain assumptions, which is similar to the cost of moving a load in the United States over a similar distance, US\$ 9.8/kg if at a much faster speed. While prices to transport goods are within international comparators, the

cost in time and uncertainty is high, especially for perishable products. This limits the feasible set of industries that Loreto can sell beyond its local market.

Loreto presents key challenges in terms of overcoming coordination failures to enable new investments in more complex activities. Economic diversification, by definition, requires learning to do things that currently do not exist in the place. Entering new productive activities is rife with coordination failures. This is the chicken-and egg problem of economic development. Consider the hypothetical example of Loreto attempting to enter watchmaking: who would want to train to become a watchmaker in Loreto if no firm would employ them; and what watchmaking firm would come to Loreto if there are no watchmakers. Coordinating the supply of new know-how with their use in production requires solving the coordination problem. Coordination becomes more complex in low-diversified areas where you need to add many unproven skillsets at once. Where coordination failures are ever-present, it is common for the State to become involved in resolving it and the response, usually through efforts to facilitate public-private coordination (Sabel et. al., 2012). Loreto has diversified into fewer new industries than other regions in Peru, which suggests weak capacity to overcome coordination and information failures. This results in weaker diversification and growth, through a slower process of self-discovery. The Growth diagnostic report presents two cases that illustrate restrictions and outcomes: the case of ‘positive deviance’ of the successful presence of a multinational beverage company, the AJE group, and the absence of a tourism port in Iquitos. In the case of the AJE group, the successful presence of a more complex, international company in Loreto stems from the company’s interest in local production of Amazonian fruit juices with the State collaboration to facilitate the incorporation of Amazonian communities into the value chain. As a multinational beverage company, the AJE group could further rely on its knowledge of the market, as marketing, packaging, and supply chain are based elsewhere, while Loreto proves a viable location to produce Amazonian fruit. For the tourism industry, a key problem was the absence of a river tourist port to properly embark visitors. The industry is forced to use private or informal ports, which lack adequate facilities to carry out the service in a clean and orderly manner.

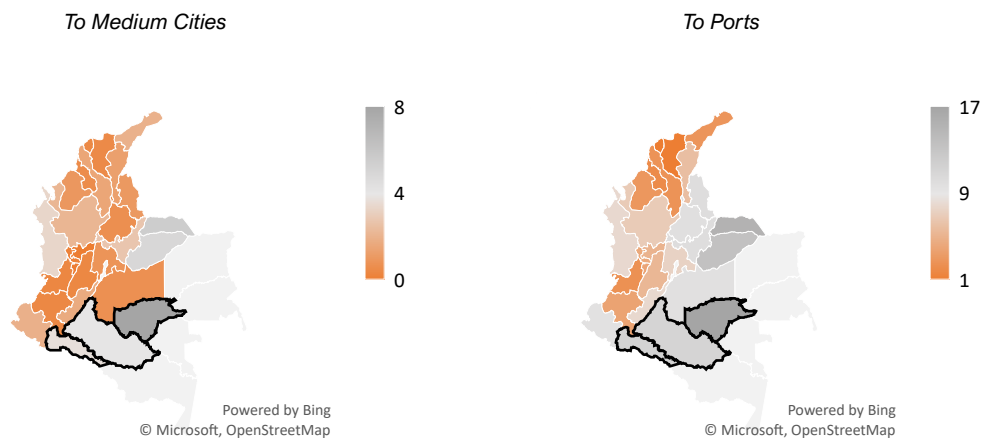
Electrical power is restrictive in Loreto, despite not appearing to be a binding restriction on current economic activity – in terms of access and cost. Outside of the mining and oil segments, (regulated) prices are moderate in Peru. Industries located in Loreto use electricity significantly more intensively than the national average. Only 4.5% of the companies in the region consider electricity to be one of the main obstacles to their growth. Loreto is not connected to the national electricity grid and uses expensive energy sources, namely isolated thermal generation and distribution systems that require subsidies and pollute the environment. According to the Ministry of Energy and Mines, for 2018, industrial electricity in Loreto (which includes the Agriculture and Livestock, Construction, Manufacturing, Mining and Fishing sectors) had an average cost of US\$ 0.118 /kWh, as compared to the average national of US\$ 0.0683 /kWh. On average, electricity for industrialists in the region is 73% more expensive. However, electricity for business and services is only 12% more expensive and residential electricity is even cheaper. This is largely because Loreto does not have businesses that are large enough to be prohibited from the liberalized tariff, which tends to be lower. This presents a few challenges: any policy action to remove the subsidies to the liberalized tariff would impact business profitability; growing the size of businesses risks paying more for electricity, incentivizing keeping firms small; and all the while these subsidies encourage greater energy use at high environmental cost.

Growth Diagnostic of Caquetá, Guaviare, and Putumayo

The low capability of the state in Caquetá, Guaviare and Putumayo poses critical questions on the factors limiting growth in the Amazon. Coscia, Cheston & Hausmann (2017) find that the lack of convergence of the poorer departments in Colombia to richer areas has less to do with institutional differences of governance within departments than with the weak social and business connections across departments through which know-how is transferred, i.e., the Amazonian departments remain remote, in critical dimensions of social and business connectivity. In the case of Caquetá, Guaviare and Putumayo, the study aimed to understand the development of local capabilities in public and private sectors and what may explain the lack of convergence to attain new, more complex national capabilities.

The low economic complexity of CGP constrains the economic development and labor markets of the Amazonian departments. Coordination failures occur when a group of economic actors (e.g., workers in a place investing in training in a new skill and firms requiring that skill deciding on where to locate their investment) could achieve a better outcome but fail to do so because they do not coordinate their actions. In the Colombian Amazon, coordination failures are prevalent in all three departments and explain the region's lack of income convergence. CGP's limited base of capabilities is not only binding to the region's economic development but can explain some of the key structural features of the region's labor market, such as the region's high levels of informality and the concentration of employment in public services and low-productivity retail and agriculture (as well as extractive activities in Putumayo). The Growth Diagnostic finds that, at the department level, there is a negative relationship between economic complexity and the likelihood of labor informality. In CGP, both formal and informal workers work in smaller businesses than the rest of Colombia, which is consistent with their low capability trap. The report finds this is partially driven by the failure of the urban areas in CGP, which include sizeable cities such as Florencia, San Vicente del Caguán, San José del Guaviare, Mocoa and Puerto Asís, from acting as poles of growth by offering a wider pool of skills to achieve not only larger firm size but to sustain greater complexity.

Figure 9. Average Travel Times from Urban Areas (2019)
Hours

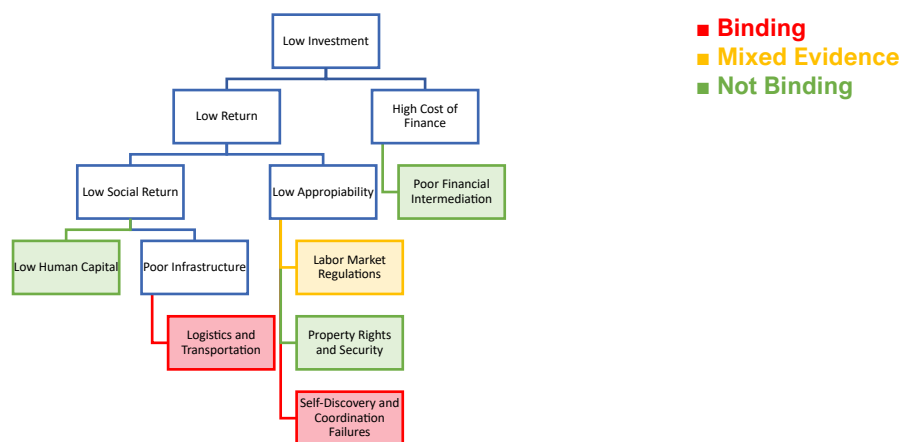


Source: authors' elaboration based on Global Friction Surface, Open Street Maps and Google Maps. Estimates excludes Amazonas and San Andres, outliers in the data.

The remoteness of the Colombian Amazon further interacts with the limited capabilities available to restrict the viability of new productive activities. Remoteness in itself is a function of the particular geographical position of CGP and the quality and quantity of available logistics and transportation infrastructure. Caquetá, Guaviare, and Putumayo have some of the longest travel times to major cities and ports of all departments in Colombia (Figure 9), and the cost per ton transported is almost twice as high as in the rest of the country. Air connectivity is among the lowest in the country despite air being the only form of transport for some remote towns in these Amazonian departments. The remoteness of these departments increases the cost of ‘exporting’ goods to markets outside the departments. This weakens the competitiveness of all industries and limits the feasible set of industries that can be produced there to those that are not sensitive to higher travel cost and time. Achieving the economic goals for the Colombian Amazon must carefully consider improving the connectivity of the departments with external markets.

The risk of deforestation reduces incentives to improve the connectivity of Amazonian departments with major cities and export markets. Poor connectivity contributes to the low economic complexity of the departments. In turn, the low complexity reduces incentives to coordinate new investments that would generate returns to greater connectivity. The vicious cycle between remoteness and low complexity limits diversification and the coordination of new capabilities and investments to generate new jobs and higher incomes.

Figure 10. Growth Diagnostics Tree for CGP



Source: adapted from Hausmann, Rodrik, Velasco (2008)

The Growth Diagnostic of CGP posits that economic growth in the Colombian Amazonian is limited by a “connectivity trap.” The study identifies two binding constraints to more sustainable and inclusive growth: (i) weak connectivity to external markets; and (ii) limited state capacity to overcome coordination failures for new investment. In essence, the lack of external market connectivity restricts economic complexity, and, in turn, low complexity fosters the coordination failures that limit returns to new diversification. Ultimately, low returns to diversification further reduce incentives to improve connectivity. Underpinning the connectivity trap is the belief that limiting the connectivity of Amazonian departments with large Colombian

cities and the broader global economy will limit incentives for deforestation.² Yet, deforestation has accelerated in recent years, despite the continued poor connectivity. Turning to policy, the report suggests differentiating between policy instruments required to protect the forest and those to drive economic growth. The focus must be on the sequencing of reforms to put in place an adequate set of policies to curb deforestation to then drive policy required to achieve the economic ambitions of the departments.

Policy Options for Loreto

Removing the barriers to the connectivity of Loreto involves more efficient and predictable ways of moving merchandise by river, given the high environmental and economic costs of alternative transport. Reducing the costs and times of fluvial transport of merchandise, including the associated uncertainty, and increasing the presence of the State were precisely the objectives of the Amazon Waterway. This project has the potential to improve navigability conditions along 2,687 km of the Marañón, Ucayali, Huallaga and Amazonas rivers and thus contribute to the development of trade in the North Interoceanic Corridor that integrates the port of Paita with the axis of the Amazon. According to the Ministry of Economy and Finance, the Waterway would reduce transportation times by 20% and increase the cargo transported by 3.5 times the volume.

To facilitate diversification, Loreto should implement new forms of public-private coordination, *Mesas Ejecutivas*, for strategic industries identified in the Economic Complexity Report. Peru is already a pioneer in the successful implementation of the *Mesas* (Executive Tables) at a national level as a means to accelerate diversification, but they are not having impact locally in Loreto. The Loreto government could extend the specific teams that fit the local opportunity to hold special meetings to pitch the opportunity in Loreto. Three groups should be top priority: agribusiness, chemical industries, and tourism, as established in the project's complexity report (Hausmann, et al., 2020). The teams should aim to follow the example of the National Forestry Executive group in 2015 that solved constraints related to input access and regulation for sectoral operation. These groups should comply with three vital characteristics: (i) organized at the level in which firms face shared problem (for example, tourism operators that are constrained by the lack of water port access); (ii) actors that have some existing interaction with the State (for example, the AJE group); and iii) industries with export potential (goods and services). Moreover, the Growth Lab's policy report for Loreto proposes the establishment of contests on sustainable business models to mitigate information failures and establishing a decentralized innovation office to facilitate collaboration with the private sector.

On energy access, Loreto should invest in solar energy to mitigate its reliance on one of the most expensive, volatile, and polluting sources of energy generation: diesel and residual fuel plants. Solar energy is the only technically viable renewable source that has the potential to reduce fuel consumption in thermal generation plants and produce savings in the electrical system. Its viability depends on the variables that determine its economic benefit and the distribution of the net gains that would result from the solar provision. Given the large initial investment, the provision is feasible in scenarios of relatively high oil prices and relatively low efficiency losses. Beyond the economic benefits, it is necessary to consider the benefit to the environment of replacing the current generation plants with solar energy. If these environmental

² It is important to note that while property rights were deemed as a factor critical to protect the forest in Colombia, they are not a binding constraint to growth in CGP.

benefits are internalized as much as the need to bring energy provision to the level needed to lower barriers to growth, the implementation of initial investment subsidy schemes by the State and environmental organizations can be evaluated. This possibility holds further profitability if technological progress further reduces the costs of provision and storage of solar energy (in batteries) in the medium term.

Policy Options for Caquetá, Guaviare, and Putumayo

The deforestation dynamics in Colombia have led to a perceived trade-off between economic development and the protection of the forest; our research finds this is a false dichotomy. Although economic and environmental goals are often held as incompatible in public debate, in practice, the acceleration in deforestation has not led to any convergence of economic outcomes between the Amazonian departments and the rest of the country. The expansion of cattle-ranching that has pushed the agriculture frontier into the forest is not economically complex: although it may have offered a subsistence activity to some of the region's landless peasants, it has failed to improve overall the economic development of the region. The majority of the Amazonian departments' population works in non-forested cities and towns, that do not significantly benefit from deforestation.

The Colombian Amazon needs a new forest protection law based on a simple premise: define the forest you wish to protect and put it under a legal regime that eliminates moral hazard. In order to halt deforestation, policy options target ending land speculation and road construction in areas with uncertain legal regimes regarding land appropriation. Officials should accelerate the completion of Multipurpose Cadaster in high-risk forested municipalities to define existing land use as a means to demarcate protected forest territory. The forest areas designated for protection should be placed under a legal regime that builds on the success factors of National Parks and Indigenous Territories (Revelo-Rebolledo, 2019), in prohibiting future land formalization, road construction and most economic activities including cattle-ranching. This legal regime should be supported by a coordinated approach to take legal action on, and operationally recover, land that has been illegally deforested. The report also calls for a series of "second-best" policies that aim to make forest protection more profitable than extensive cattle-ranching as a means of land use. Reducing the viability of cattle-ranching in forested areas should leverage technological solutions to tracing mechanisms to guarantee deforestation-free cattle. While reforestation is not profitable under today's prices, one can imagine a future where carbon titling is more enforceable and tradable to the global market at much higher prices, to make reforestation the preferred activity. The law should also align incentives across levels of government to curb deforestation by conditioning departmental and municipal transfers to deforestation performance. By establishing a unified national policy framework to tackle deforestation, the government will be well-positioned to coordinate the financing of these plans with the donor community to protect the global public good of the Amazon forest.

Achieving shared prosperity in the Amazon depends on the connectivity and opportunity in its urban areas. The new forest protection law should also include a new economic strategy for the Amazon to coordinate new economic opportunity in its cities. A new pact must transition from the current extractive model to a model that finds opportunity in the forest's biodiversity and existing productive capabilities in urban areas. The strategy should be territorial across three geographies of opportunity: (i) **in cities**, through tourism services, transport services, professional services, and agro-processing industry; (ii) **in rural non-forested areas**, in more intensive crops and sustainable agroforestry; and (iii) **in forest areas**, based on ecotourism,

carbon markets for reforestation, and forest protection services. Achieving urban prosperity depends not only on improving the public services in cities but on enhancing the transport connectivity with other cities in Colombia and beyond. This extends beyond the control of governors in Amazonian departments, to improve the primary road infrastructure outside of their departments, as justifying the need for national-level coordination of strategic road projects that integrate environmental concerns. Inter-departmental road infrastructure is the key constraint to greater agro-processing and crop production for these departments to sell to external markets; improving the quality and service of air transport will be critical to expand tourism. The need for a coordinated approach to this economic strategy calls for the creation of an Amazon Productive Development Taskforce to coordinate national, departmental, and local government entities – as well as private and non-government organizations – to implement productive policies for the region. In the same way ProColombia aims to attract global investors to come to Colombia, so too must the Amazon Taskforce expand the local government’s reach to attract investors from other to come to Amazonian cities, in a way that recognizes the diversity of local productive opportunities across Amazonian departments, e.g., tourism in Chiribiquete National Park for Caquetá and Guaviare vs. professional services in Putumayo.

3. Methodological Innovations

The Loreto and Caquetá, Guaviare and Putumayo projects demanded an additional layer of innovation given the remoteness and ecological relevance of the Amazon. Compared to other contexts the Growth Lab has worked with, the population of Loreto and of Caquetá, Guaviare and Putumayo live in areas where economic activities need to be carefully selected to comply with environmental protection, as these regions hold a natural asset and a global public good. In spite of the economic challenges posited by remoteness in each context, both projects found that growth and environmental hazards do not necessarily go hand in hand, as these regions have diverged economically, alongside distinct dynamics of deforestation. This key initial insight led the teams of each project to develop important methodological innovation in the Growth Lab’s work.

The Loreto Project used a novel approach for a phased sector prioritization with an environmental filter. In Loreto, the Growth Diagnostic identified electrical generation as a constraint, as the creation of high-energy industry would be forced to be powered by environmentally harmful sources of energy. The model for identifying new economic activities for diversification included a novel “environmental filter” to consider the environmental emissions caused by the industry. Following the complexity analysis, the team reduced the list of potential industries over four different dimensions (i) viability (i.e.: presence in similar departments, capacity to access intermediate inputs, propensity for aerial exports, and intensiveness in electricity), (ii) attractiveness (i.e.: potential to attract Foreign Direct Investment regionally and globally, the export share of the industry and the capacity to generate employment), (iii) environmental impact (i.e.: water pollution potential, deforestation enhancing, environmental contamination, air pollution with toxic substances and Greenhouse Gas Emissions), and (iv) whether these industries are present or absent in Loreto (intensive and extensive margin, respectively). This analysis yielded Figure 11 below, which has four quadrants according to the priority level: Phase 0, which includes industries with high attractiveness and viability which can be done first, especially those at the intensive margin (circles), followed by Phase 1 with industries in quadrant I that would constitute an extensive margin. Phase 2 includes

activities in both quadrants II and III that have a low environmental impact and, finally, Phase III includes those industries in quadrant IV with low environmental impact (green and some yellow).

Figure 11: Prioritization of diversification opportunities in Loreto based on their viability, attractiveness and environmental sustainability

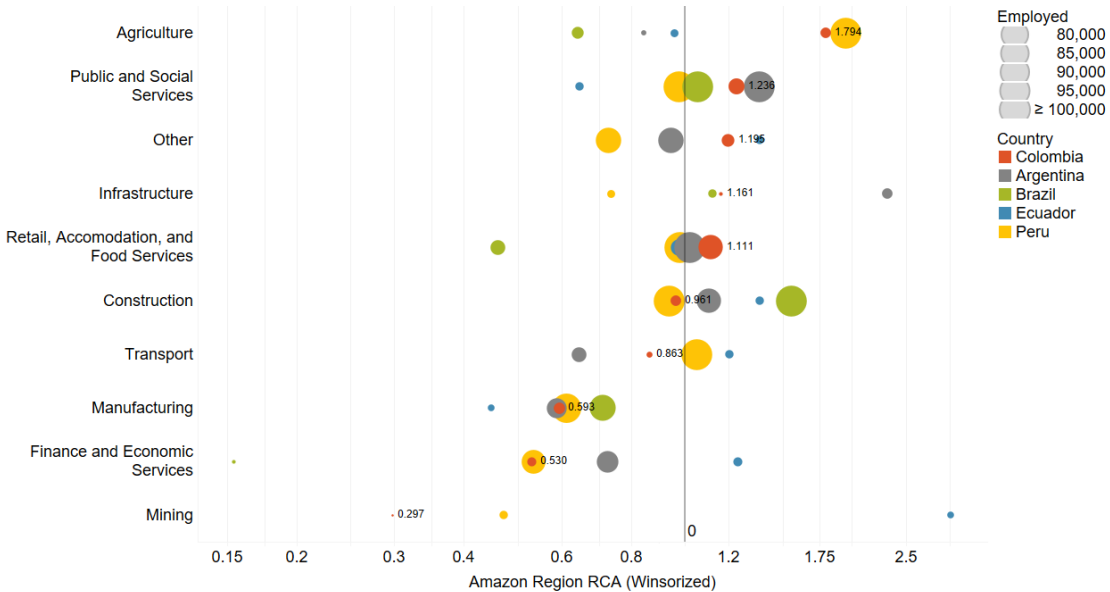


Doing growth diagnostics at the subnational stage required thinking of the methodology differently from the original framework. Some of the caveats to the original framework that were considered in the projects included setting adequate benchmarks for the region (both domestically and in other countries) and choosing the characteristics over which to benchmark the regions. In the case of Caquetá, Guaviare and Putumayo, their relative position with respect to other departments in terms of both income and employment outcomes, as well as in terms of the supply of different inputs, implies that a comparison with other departments in Colombia could be sufficient since the departments are significantly far from the country’s productivity frontier. In the case of Loreto, the analysis compared the region to other Peruvian departments and also Amazonian departments and states in both Colombia and Perú, where it was found that Loreto did better than Colombian peers and trailed certain Brazilian states like Amazonas. The analysis in Colombia included – particularly for an economic complexity exercise – a set of international peers to enrich benchmarking exercises. With the caveat of limited data comparability due to harmonization, the comparison yielded some useful results to position CGP’s industries within a regional context (Figure 12).

Additionally, the type of data that is often used for Growth Diagnostics is sometimes insufficient at the subnational level. This is often the case for enterprise survey data (containing subjective and objective indicators on firm performance) or data on the country’s financial system. Other subnational projects carried out by the Growth Lab, including Western Australia and Chiapas faced similar barriers. In the case of Loreto and CGP, the teams relied on

datasets that enabled the comparison of the states with their domestic peers, but also across borders including: the Dun & Bradstreet (D&B) Business Registry, fDI markets, and national household surveys for comparability. In the Colombia project, the analysis used datasets that allowed measuring deforestation intensiveness such as the Global Forest Watch and Colombia's IDEAM, Colombia's Ministry of Transport Cargo dataset to determine the additional cost of road transport into the three departments studied, and also the subnational analyses from the Departments Competitiveness Rankings for comparisons across departments.

Figure 12. Amazonian Region ranked industrial RCAs
 RCAs in logarithmic scale



Sources: authors elaboration based on Gran Encuesta Integrada de Hogares (Colombia), Encuesta Permanente de Hogares (Argentina), Pesquisa Nacional por Amostra de Domicilios Continua (Brazil), Encuesta Nacional de Empleo Desempleo y Subempleo (Ecuador), Encuesta Nacional de Hogares (Perú)

4. Conclusions and Lessons Learned

In both the Peruvian and Colombian Amazon, the research fails to find evidence of a tradeoff between economic growth and forest protection. In both Loreto and Caquetá, Guaviare and Putumayo, the teams did not find that environmental degradation had driven economic growth. In the case of Loreto, the sectors that were driving the department's growth were non-extractive. When comparing Loreto's non-oil economy to the rest of Peru's, the department performed like the rest of the country's average. In Caquetá, Guaviare and Putumayo, the rise in deforestation in 2016 did not lead to higher growth in these departments, instead the departments' income levels have diverged from peers and the rest of Colombia.

Admittedly, the world has found alternative solutions that avoid the need for development and deforestation to be at odds. The solution shifts incentives away from land expansion to land intensification: on high-density activities that afford higher productivity and wages. The excessive focus in Colombia on land ownership as the means of wealth and power helps explain the prevalence of extensive cattle-ranching over intensive crop agriculture, even though agriculture is the more profitable activity. A 2016 FAO study found agriculture earns 6.9 times

more than livestock (US\$ 163,523 versus 23,872 per square kilometer, respectively). In Colombia, livestock cover 39 million hectares as compared to 4.6 million under agricultural cultivation. The solution to deforestation, as with that of creating shared prosperity, relies on generating better opportunities in cities to pull more people in from rural areas to reduce the pressure on expanding the agricultural frontier into the forest.

The two projects found that economic diversification of Amazonian cities can curtail environmental degradation through different channels, specific to the context of each region. In the case of Loreto, deforestation around Iquitos is relatively lower than in areas that are in the agricultural frontier, like Caquetá, Guaviare, and Putumayo. In each region, the drivers of environmental hazards differ: in Loreto these tend to be more related to mining, while in Colombia these are more related to land speculation primarily through cattle-ranching. In the case of the Colombian Amazon project, the policy options aim to address the causes of deforestation directly as cattle ranching is a non-complex activity that fails to drive growth in the region. In the case of the Peruvian Amazon, the proposals aim to diversify into more complex, non-oil sectors that build off existing knowhow.

The sources of economic opportunity show significant diversity for cities across the Amazon; by contrast, the forces of deforestation appear to be shared across the Amazon. Deforestation is the result of basic market economics, where the private returns to owning deforested land are higher than the social returns of keeping that land as a forest. In theory, deforestation will be highest where private returns are highest, as determined by where: land prices are highest; costs of clearing the forest are lowest; and where the (legal or illegal) means of appropriating those returns are easiest. In the Amazon, theory maps well to the reality, as deforestation occurs where land prices are highest based primarily on proximity to public investment, particularly roads and electricity, using slash-and-burn techniques followed by extensive cattle-ranching as the lowest cost means of land formalization. This explains why major events like the Peace Accord in Colombia, which promised greater economic growth via public investment and lower deforestation via state control, in reality accompanied record rates of deforestation. The Peace Agreement further increased the private returns to deforestation, by increasing land prices due to the promise of greater security and public investment (e.g., roads, electricity) (Vanegas, et al., 2022). Financial markets were more efficient in channeling finance toward new land speculation than the state's ability to increase capacity to enforce forest protection laws, with deforestation accelerating most in forest areas allowing for legal subtraction from forest reserves. The same calculus explains why deforestation is faster in those parts of the forest with primary road connections to the rest of the country (e.g., Caquetá, Guaviare, and Putumayo) than in those areas without a primary road connection (e.g., Loreto, but also Amazonas and Vaupes in Colombia). Similarly, deforestation is faster in the parts of the Amazon where cattle-ranching has greater historical presence (e.g., Caquetá and Guaviare vs. Putumayo or Loreto) as the lowest cost means to demonstrate land use for formalization.

The idea of regional specialization centered on raw material extraction is deeply held by policymakers globally and locally, but also happens to be one of the most dangerous ideas in development. While intuitively powerful, this conventional wisdom fails to prove true empirically. Individuals specialize, as often do firms, but what results is that countries and regions diversify. Greater individual specialization translates into the diversification of production at the regional and country levels. The idea of adding value to local raw materials is not wrong, but limiting, as few modern products are developed from a single raw material. The more successful approach taken by economic success cases globally is to start not from raw

materials, but from local productive capabilities to identify new activities that also rely on those existing capabilities. Approaching the Amazon rain forest solely for its raw materials is limiting, considering that the greatest natural resource is the forest itself. A new approach is required, one that recognizes the potential economies of tourism and forest protection services as opening more opportunities than the extractive economy. The challenge is that these activities require a distinct set of capabilities to those of extraction. Without a change in approach, the Amazonian departments are unlikely to realize shared prosperity from an extractive approach.

Loreto, Caquetá, Guaviare, and Putumayo share a common set of challenges – and solutions – when it comes to their remoteness. Land transport is only feasible to Loreto's main economic center, Iquitos, via river and this mode is unpredictable and lengthy, in spite of its low cost. In Caquetá, Guaviare and Putumayo, roads do access the main population centers, but travel times and costs to the rest of the country remain higher than for other regions of Colombia. This constraint to growth affected these departments and the possible set of industries that could allow for diversification and driving a more sustainable growth model. The policy recommendations in each engagement focused on improving air and river connectivity, while being strategic about road infrastructure in non-forested areas in the case of Colombia, as very capillary roads contributed to deforestation along the agricultural frontier. The constraint in these two projects also motivated the Growth Lab's workstream of remoteness and economic development, on thinking how these two locations could become better integrated while preserving their natural advantage.

The projects in the Peruvian and Colombian Amazon also found a common binding constraint in terms of coordination failures, but with different implications specific to each location. In the case of Loreto, the project found Iquitos had higher capabilities than expected for their income per capita, in terms of economic complexity. The question then became how to unlock knowhow to allow diversification to occur. The growth diagnostic found the region required better coordination to allow for new industries to flourish. In the case of CGP, all three departments, especially Caquetá, were in a low capability trap. This equilibrium affected labor markets and also drove the main driver of deforestation in Colombia: cattle ranching as a tool for land appropriation. Here both regions differed: Loreto had a higher capability baseline that needs to be unlocked while CGP begin at a much lower level. This consideration provided nuance in determining the specific bets and strategies each department could follow for productive diversification. On one hand, Loreto can pursue policies to facilitate jumps into more complex and environmentally beneficial sectors, while CGP can focus in facilitating the emergence of logistics and transportation services, together with ecotourism, agroforestry and more sustainable land uses for forested areas and areas at risk of being deforested.

The ultimate path to prosperity in the Amazon is by making forest protection the most profitable activity, by realizing the potential of carbon markets. Deforestation is driven by basic market economics: the private returns to owning deforested land are higher than the social returns of keeping that land as a forest. The goal of policy should therefore be to make forest protection and reforestation more profitable than cattle-ranching. Reforestation with carbon credits is not a profitable activity in any Amazonian country at today's prices and with carbon titles that are unclear and costly to enforce. Making carbon credits tradable, to take advantage of international carbon markets, with prices of \$80 per tCO₂e in the European Union vs. \$5 in Colombia, offers a transformative market that would shift incentives toward forest protection. To capture the potential gains, each Amazonian country must accelerate the steps now toward carbon market integration, to strengthen its legal framework, certifications, oversight,

reforestation capabilities, and related technologies for contracting and enforcement. The challenge remains that deforestation can operate at alarming rates with the actions of a few, in which greater participation in environmental services or slight gains in carbon prices may not provide a sufficient solution. Continued attention is needed to forest protection policy to coordinate actions and align incentives across government, eliminate moral hazard, and improve enforcement alongside local community empowerment. The direction of change is clear in which prices must rise to incentivize for all the shift toward forest protection. While today's prices remain too low, one can imagine a near future in which the right government investments make carbon titles readily contractable and sold in the global market at much higher prices to make forest protection the best means to prosperity.

The lessons from the engagements between the Growth Lab and the Moore Foundation in Perú and Colombia show Amazonian contexts have more in common than differences, although a few distinctions matter for policy. These lessons offer potential groundwork for analysis in other Amazonian regions. The nature of the constraints found in Loreto and in Caquetá, Guaviare, and Putumayo, can be further extended to the analysis of other areas of the Amazon rainforest to rethink extractive approaches or those that presume a dichotomy between forest protection and economic growth, to one that values the Amazon for more than its trees. The approaches to economic prosperity matches well to the lessons of the Amazon ecosystem: to diversify the capabilities available in Amazonian cities to mirror the ecological biodiversity of the Amazonian biome to better achieve shared prosperity without sacrificing the forest.

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